Intestinal obstruction, an overview

Rachel SM Heard
Martyn D Evans

Abstract

Intestinal obstruction is a common condition with substantial morbidity and mortality. It is commonly divided into small and large bowel subtypes. Common causes of small bowel obstruction (SBO) are adhesions and hernias; of large bowel obstruction (LBO) are cancer and diverticular disease. Prompt surgical referral is advised for both subtypes. There are several conditions which may mimic obstruction, including pseudo-obstruction and ileus. The initial management is the same for both SBO and LBO, i.e. resuscitation, symptom relief and assessment for diagnosis and complications. Because of the need for prompt surgical intervention in the presence of complications, resuscitation and investigation should occur simultaneously. The radiological investigation of choice is a CT scan, as this can assess for aetiology and complications such as ischaemia or perforation, as well as confirming a diagnosis of bowel obstruction. In uncomplicated adhesional SBO, it is often appropriate to instigate a conservative approach for the first 24–48 hours, with a nasogastric tube and IV fluid resuscitation, with or without a Gastrografin challenge. For all other aetiologies of bowel obstruction, surgery will probably be required to resolve the obstruction. A key factor in reducing mortality is the early recognition and management of complications of bowel obstruction.

Keywords Adhesions; bowel obstruction; colorectal; colorectal cancer; emergency surgery; hernia; pseudo-obstruction; SEMS; surgical intervention; volvulus

Introduction

Intestinal or 'bowel' obstruction is a common presentation to the surgical emergency intake. It results from a mechanical blockage at one or more points in the intestinal tract, leading to hold up of gastrointestinal contents above the obstruction point. It can be classified into small and large bowel subtypes, based on obstruction location. Other methods of classification are based on duration of symptoms (acute/chronic/recurrent) or site of pathology (extrinsic, mural or luminal) causing obstruction. It may also be classified as uncomplicated or complicated, based on the presence or absence of complications, including perforation and bowel ischaemia. One of the key facets of management of bowel obstruction is the early identification of complications, as the presence of these mandates urgent surgical intervention. Otherwise, treatment will depend on the cause of obstruction and the clinical condition of the patient, but may involve conservative, medical or surgical management, or a combination of these. Prompt diagnosis and treatment is required to prevent life-threatening complications. The aim of this manuscript is to give an overview of the causes, presentation and management of bowel obstruction.

Rachel SM Heard ***BMedSci BMBS PGCE FRCS*** *is a post-CCT Fellow in Colorectal Surgery at Swansea Bay University Health Board, UK. Conflicts of interest: none declared.*

Martyn D Evans ***BM MPhil FRCS*** *is a Consultant Colorectal Surgeon at Swansea Bay University Health Board, UK and Associate Professor of Surgery at Swansea University. Conflicts of interest: none declared.*

Small bowel obstruction

Causes

Small bowel obstruction (SBO) is a morbid condition, with inpatient mortality observed in 8% of patients admitted with SBO.[1] It may result from luminal, mural or extrinsic pathology causing compression of the adjacent bowel. The most common of these is extrinsic causes, with adhesional obstruction accounting for 54% SBO cases and abdominal wall hernias a further 19%.[1] Mural (i.e. within the bowel wall) and luminal causes are less common.[2] Some of the causes of obstruction are summarized in Table 1.

Presentation

SBO classically presents with abdominal pain, distension, vomiting and constipation. The pain is often colicky but poorly localized. Continuous pain is a more worrying sign as it may indicate complications of SBO, which are further discussed below. Colicky pain results from increased intensity of gastrointestinal (GI) peristalsis as the bowel tries to force contents through the site of obstruction. Distension may be more apparent in those with a more distal obstruction as there is a greater length of distended bowel proximal to the obstruction. In contrast, vomiting is an earlier feature in those with a more proximal obstruction, as there is less capacity to 'store' GI contents, and therefore usually less abdominal distension. Patients may pass stool or flatus per rectum for some time as there will be luminal contents distal to the blockage from prior to obstruction. However, classically constipation is a feature. This may be described as 'absolute' constipation if the patient cannot pass flatus or faeces.

Red-flag signs, indicating potential progression to complications such as ischaemia or perforation, include severe pain or peritonism. Both of these may result from a closed-loop obstruction, where there are two points of compression on the bowel such that both ends of the affected loop are occluded. The affected loop becomes increasingly distended with gas and

Causes of small bowel obstruction

Extrinsic	Mural	Luminal
Adhesions	Inflammation (including Crohn's)	Gallstone Ileus
Hernia	Anastomotic stricture	Foreign bodies
Volvulus	Congenital atresia	Parasites
Adjacent masses	Intussusception	Constipation
Endometriosis	Primary tumour	Bezoars

Table 1

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intestinal fluid, to the point it may perforate. Similarly, if a band adhesion lies across the mesentery of a small bowel loop, resulting in a closed loop obstruction, it may compromise the blood supply, resulting in ischaemia (Figure 1). These patients may be haemodynamically unstable due to sepsis or severe dehydration. Acute kidney injury (AKI) is common, affecting 22% SBO patients at presentation.[1]

Assessment and investigation

A thorough history, in particular of any previous abdominal surgery, should be taken and the abdomen examined, noting any surgical scars and checking for abdominal wall hernias, including groin examination.[3] A rectal examination will help to exclude a very distal mass or constipation as a cause of obstruction, and therefore may suggest whether the obstruction is small or large bowel in origin.

Bedside observations are important to assess hydration status and for early signs of sepsis or other complications of bowel obstruction. These should include blood pressure, pulse rate, respiration rate, oxygen saturations and temperature. If there is a history of reduced urine output, or the patient is haemodynamically unstable, a urinary catheter should be inserted at this time to monitor urine output and guide fluid resuscitation.

Bloods should be taken, including full blood count, urea and electrolytes, liver function tests and amylase (to exclude biliary obstruction or pancreatitis as cause of pain), C-reactive protein, coagulation screen and a group and save (the latter in preparation for potential surgery). If the patient is unwell or peritonitic, an arterial blood gas may help identify bowel ischaemia, although it should be noted that a normal lactate does not exclude this. A raised lactate can also be caused by pathology such as sepsis or dehydration and is not specific to ischaemia alone.

Abdominal computed tomography (CT) is the radiological investigation of choice and is preferred over plain abdominal film for the assessment of bowel obstruction. In the National Audit of Small Bowel Obstruction (NASBO) study 80.6% had an abdominal CT on admission, but 66% patients had both an abdominal radiograph (AXR) and a CT.[2] The benefits of CT over AXR are that it not only diagnoses SBO but can also identify the cause and site of the obstruction and any potential complications, such as ischaemia (Figure 2). It is therefore advocated that early assessment by a senior surgeon could minimize radiation exposure and NHS costs via minimization of inappropriate AXR in these patients.[1] In those who regularly reattend with adhesional obstruction, and without red-flag signs, AXR may be appropriate to reconfirm the diagnosis.[4]

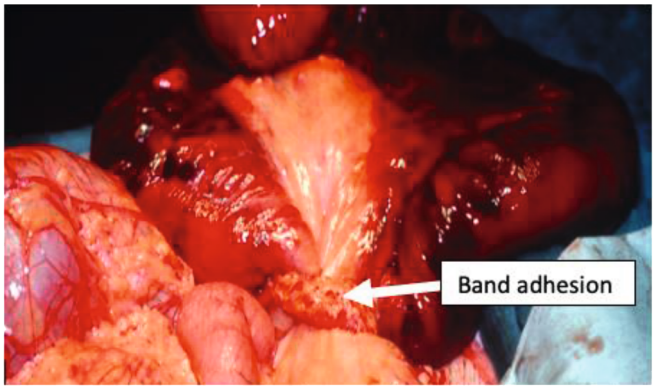

Figure 1 Band adhesion causing closed loop small bowel obstruction with ischaemia.

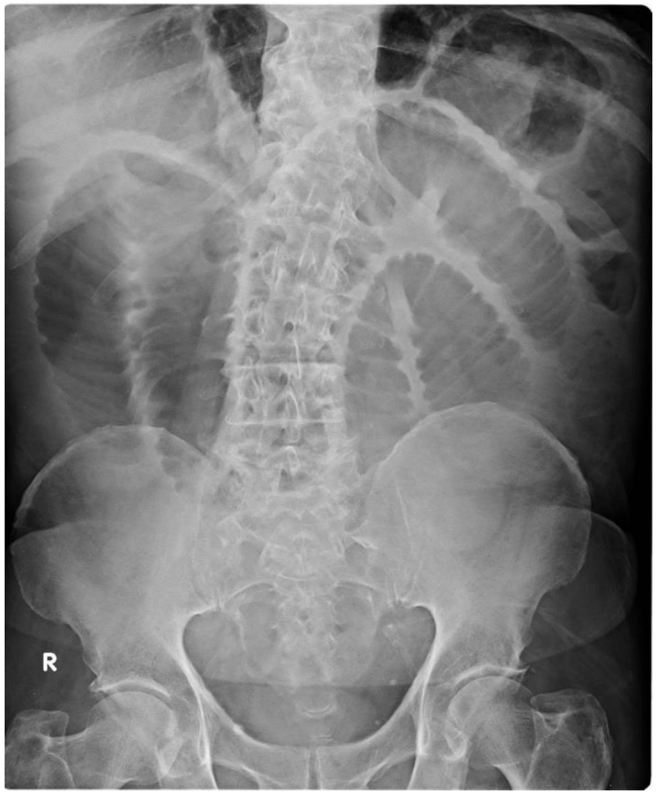

Figure 2 Abdominal radiograph showing typical features of small bowel obstruction: central dilated bowel loops, visible valvulae conniventes.

Management

Ultimately, management will depend on the cause of small bowel obstruction and the presence or absence of complications. The early identification of the latter will allow for expedient surgical intervention. However, initial management is the same whatever the aetiology: confirm diagnosis, resuscitate and prevent complications (Figure 3). Clinical assessment and imaging will suggest and confirm the diagnosis.

The patient may be very dehydrated on presentation due to vomiting and impaired GI absorption of water and electrolytes. A fifth of patients have AKI at presentation.[2] Due to fluid shifts, crystalloid resuscitation with normal saline (NaCl 0.9%) is preferred. Potassium supplementation is advocated due to the high potassium content of gastric fluid, and therefore likely hypokalaemia resulting from sustained vomiting. Haemodynamic stability should be prioritized, with rate of fluid resuscitation based on haemodynamic status and degree of dehydration. A good marker for sufficient fluid resuscitation is a urine output over 0.5 ml per kilogram body weight per hour. Serum electrolytes should be checked and replaced where required. Due to impaired GI absorption, all replacement should be given intravenously.

Prevention of complications will depend partly on aetiology of the obstruction, for instance in closed loop obstruction, operative

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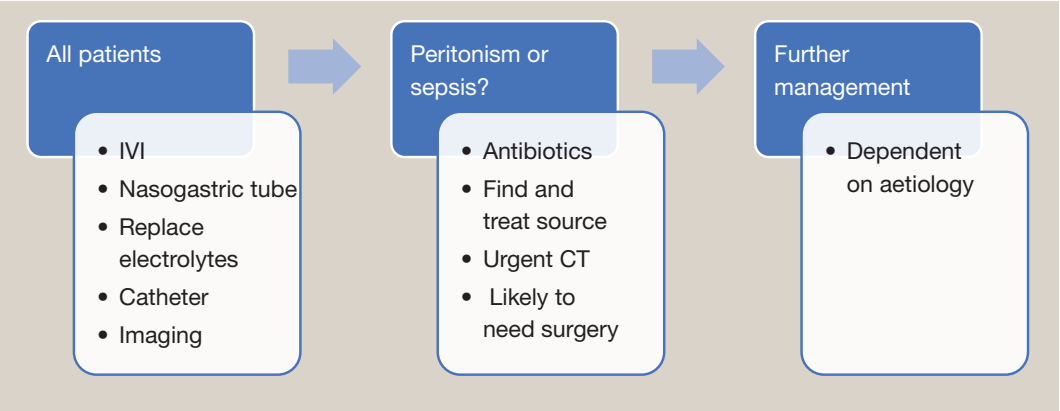

Figure 3 Overview of initial management of small bowel obstruction.

management may be required to prevent ischaemia or perforation. However, in all patients, it is worth considering nutritional state early.[4] It is not just fluid and electrolytes that the patient will be deplete in, but also nutrition. This may have been the case for several days prior to presentation, and nutritional state should be assessed early to see if nutritional supplementation is required. A commonly used tool in the UK is MUST (Malnutritional Universal Screening Tool).[5] Anyone who has gone, or is likely to go, more than 5 days without oral intake is automatically deemed high risk, and should receive nutritional support, ideally under the supervision of a dietetic or local nutritional support team.[5]

Patients showing signs of peritonism or sepsis should receive a dose of IV antibiotics, in line with the local antimicrobial guidelines for intra-abdominal infection. A nasogastric tube (NG) is advocated for anyone who is vomiting to prevent life-threatening aspiration pneumonitis. Further management beyond this will depend on the cause for the SBO.

Aetiology-specific management

Extrinsic sources of compression:

Adhesional SBO – as the most common cause of SBO, it is important to have a pathway for the management of adhesional obstruction.[4] Adhesions most commonly form as the result of previous surgery (even that performed decades previously), but they can also be congenital. They cause obstruction by causing angulation or kinks in the bowel during peristalsis, resulting in a narrowed or obliterated lumen. An abdominal CT can diagnose adhesional obstruction, identify the site of obstruction and also suggest if there are any complications such as a closed-loop, ischaemia of the affected small bowel or perforation. Any of these complications mandate an urgent transfer to theatre. If none are present, i.e. 'uncomplicated' SBO, it is reasonable to institute a trial of conservative management.

Conservative management involves placing the patient nil by mouth and inserting a wide-bore NG tube. This decompression the GI tract may allow the bowel to 'unkink' around the adhesions and therefore to start functioning again. It will also provide symptomatic relief from vomiting, distension and colicky pain. Early use of water-soluble contrast, e.g. 100 ml Gastrografin, (which can be given NG) is advocated in this group. This can not only assess the site of ongoing obstruction via imaging, but also has a therapeutic effect which may resolve the obstruction. Imaging protocols vary, but an AXR at 24 hours is fairly standard, with contrast seen in the colon at this point having a 98% predictive value for successful non-operative treatment of adhesional SBO.[6] Conservative management will lead to resolution of the obstruction in two-thirds of patients with uncomplicated SBO.[1] In those where the obstruction has not resolved with these measures, surgery is advised to be undertaken within 48 hours of commencing conservative management, or within 72 hours of presentation.[1]

Surgery in this group mostly comprises of adhesionolysis of the affected segment and any other areas of dense adhesions where there is narrowing of the adjacent small bowel lumen. In the vast majority an open approach is required, i.e. a laparotomy. In the NASBO study, laparoscopic surgery was attempted in 1 in 7 cases (usually where there was thought to be a single band adhesion), although half of these had to be converted to open surgery.[1] Where there is small bowel compromise due to ischaemia or distension, or there is injury to the small bowel (enterotomies) during division of dense adhesions, small bowel resection is performed. A total of 34% of those undergoing surgery in this group required a small bowel resection. In most cases, primary anastomosis can be performed, with only 5% cases requiring a stoma.[1]

Hernias – the management of an obstructing abdominal wall hernia (most commonly inguinal, umbilical or incisional) depends on the health of the hernia contents and whether or not it can be reduced. Hernial orifices should be examined in all patients presenting with bowel obstruction. If there is an obviously incarcerated or strangulated hernia, some argue that further imaging is not required, as it may delay definitive surgery. Others argue that imaging will provide further information on the contents and health of the hernial contents prior to surgery.[3]

If possible, reduction of the hernia should result in resolution of the mechanical obstruction, although ileus can persist for a few days. However, even if reducible, herniae presenting acutely are at high risk of future strangulation; therefore operative intervention should be planned if the patient is fit. Femoral hernias and those in female patients are at highest risk of strangulation.[3] If the hernia is irreducible, urgent repair is required to resolve the obstruction. If there is evidence of bowel compromise, i.e. hernia strangulation, then emergent surgery is indicated to attempt to salvage the contained bowel and prevent

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perforation, or to resect the affected bowel if it is not salvageable. Bowel resection brings with it the risk of anastomotic leak, and therefore avoiding the need for this by prompt surgical intervention avoids the associated increased perioperative risk.

Depending on the type of hernia, there are different options for surgical approach. Guidelines advocate a tailored approach to surgery, whereby an open or laparoscopic approach (in incarcerated groin hernias) may be appropriate, depending on the patient's fitness and past surgical history. A mesh repair is advocated, even in emergent situations, if there is no bowel compromise or need for bowel resection.[7]

An open approach is more commonly used in the acute situation. For this, a Liechtenstein (mesh) repair is advocated, and appears to have similar complication rates to a tissue (Bassini or Desarda) repair, although there is limited literature comparing groups when there is bowel necrosis or need for resection. If there is bowel perforation or abscess secondary to necrosis, consensus opinion is to avoid the use of mesh.[3]

Laparoscopic groin hernia repair may be via a trans-abdominal pre-peritoneal (TAPP) or totally extraperitoneal (TEP) approach. The technical details of these are outwith the scope of this paper. Femoral hernias may also be repaired via a laparoscopic approach. There is insufficient literature to recommend an optimal approach, but inguinoscrotal hernias, previous abdominal surgery and severe comorbidities are proposed contraindications to laparoscopic repair.[3]

There are three described approaches for an open femoral hernia repair, based on the level of incision in relation to the inguinal ligament: high (McEvedy), transinguinal (Lotheissen) and low (Lockwood). In an emergency setting, the McEvedy approach is advocated as the high incision allows for entry into the peritoneal cavity to assess the viability of the hernia contents and to resect a small bowel segment if required. Although suture repair of femoral hernia is an accepted technique, mesh repair is preferred due to lower recurrence rates. Preperitoneal mesh is preferred over plug mesh repair due to lower postoperative pain.[3] In the elective setting, laparoscopic repair is preferred due to lower recurrence rates and the possibility to inspect for bilateral hernias or other pelvic pathology.[3]

Other extrinsic sources of obstruction are relatively uncommon, with adjacent masses or infection accounting for only 7.5% of cases in NASBO.[2] These require a more case-specific approach depending on the site and cause of obstruction. It seems reasonable to manage infective cases with antibiotics or radiological drainage in the first instance, with surgery reserved for patients with sepsis or not responding to medical management.

For those with malignant obstruction, management will depend upon the site of obstruction, patient condition, overall prognosis and whether the obstruction is single-site or multilevel. In a stable patient with a single site obstruction, it may be reasonable to resect or bypass the site of obstruction to alleviate symptoms and enable oral nutrition. However, in patients with multilevel obstruction there are limited surgical options as alleviating one site of obstruction may unmask obstruction at other sites and therefore not relieve symptoms. There is some evidence that intravenous corticosteroids may be used, alleviating obstruction in up to one in six patients with SBO caused by malignant peritoneal disease, but data is of low quality.[8]

Mural pathology: accounts for approximately 10% of SBO cases.[2] Management will depend on the aetiology, whether there are any medical options and whether it is single or multi-focal. Intussusception, primary neoplasia, anastomotic stricture or volvulus affecting the small bowel are likely to require surgery, usually with resection of the affected segment.

Inflammatory bowel disease (IBD) may have medical management options such as IV steroids or immunological therapies and is best managed in conjunction with the gastroenterological team. If the affected segments are fibrotic, rather than inflammatory, strictures then medical management is unlikely to resolve the issue, and surgical intervention is indicated. In Crohn's disease, if strictures have failed to respond to previous medical therapy, and are amenable to surgical intervention, then it is advocated to explore surgical options.[9] These options may be in the form of resection of a longer fibrotic stricture, or potentially stricturoplasty of shorter stenotic segments if there are concerns about residual small bowel length.

Infectious aetiologies may be managed with antibiotic therapy, with surgery reserved for those not responding to medical therapy, or with signs and symptoms of complications such as perforation.

Luminal causes of obstruction: the most uncommon type of SBO, caused by blockage secondary to an impacted body in the lumen of the small bowel. Examples of luminal causes of obstruction include gallstones and bezoars.

Gallstone ileus is a misnomer, as the 'ileus' is not paralytic but mechanical secondary to impaction of a gallstone in the small bowel lumen. It accounts for only around 1% of SBO cases.[2] It occurs when pressure necrosis over time enables a gallstone to erode through the wall of the gallbladder into the small bowel, usually the duodenum, leading to a cholecysto-duodenal fistula. The gallstone may pass through the bowel and be excreted in stool, or may become lodged at a point of narrowing, resulting in SBO. The most common site of obstruction is the terminal ileum or ileocaecal valve, although obstruction can occur at any point in the GI tract.[10] Management is surgical, consisting of enterolithotomy with resection of the affected segment of small bowel if there is evidence of perforation or pressure necrosis secondary to the stone at the site of impaction. When undertaking surgery for gallstone ileus, the surgeon should palpate the proximal bowel to ensure there are no further escaped stones which could become impacted as they subsequently pass through the small bowel.

A bezoar is a conglomerate of non-digestible foreign material in the GI tract, for example high-cellulose foods, certain slow-release medications or hair. Most commonly found in the stomach, they can travel along the GI tract, potentially causing obstruction in the small bowel. Internationally, bezoars are thought to account for approximately 3% cases of small bowel obstruction.[11] Many patients with bezoars have a history of past gastric surgery, particularly vagotomy and pyloroplasty for ulcer disease. Bezoars may form within the small bowel, especially in small bowel diverticulae, where they can cause intermittent or continuous obstruction. Symptoms include those seen in other causes of SBO, but also may include evidence of GI bleeding, e.g. melena or anaemia. This is due to necrosis or mucosal ulceration secondary to pressure from an adjacent bezoar. CT is the imaging

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modality of choice, being 90% sensitive and 60% specific for bezoars. As a rule, if a bezoar is identified in the small bowel as a cause for obstruction, surgical intervention to remove it is advocated within 48 hours.[11] Laparoscopic surgery can be considered, but laparotomy is advocated for multiple bezoars, copious adhesions or complications such as necrosis, ischaemia or perforation. In the latter cases, small bowel resection with anastomosis or stoma is advocated.

Conclusion: small bowel obstruction

SBO is a common and potentially lethal condition. The commonest cause by far is adhesional obstruction. If uncomplicated, this will often settle with supportive management. If complicated by perforation or ischaemia, prompt surgical intervention is required. Of the other causes of SBO, the vast majority will require operative intervention to prevent complications. Expedient surgery will also hopefully avoid bowel resection (and the increased morbidity and mortality associated with this) in many cases by intervening before there is irreversible ischaemia or perforation.

Large bowel obstruction

Causes

Large bowel obstruction (LBO) is less common than SBO. As for small bowel obstruction, causes can be divided into extrinsic, mural and luminal. However, the commonest causes are mural, specifically cancer and diverticular strictures. Other common causes include volvulus and hernias. Rarer causes are similar to those seen in SBO.

Presentation

The presentation of LBO tends to be with constipation, abdominal distension and vomiting. Onset of symptoms tends to be more insidious with large bowel obstruction than SBO, as distension may build gradually in a distal obstruction and vomiting is often a late feature. Vomitus classically commences with foodstuffs consumed, followed by bilious and then faeculent vomiting, as contents from increasingly lower points in the GI tract are expelled. Pain, similar to SBO, is usually poorly localized and colicky. Again, pain becoming continuous is concerning for complications of bowel obstruction.

Constipation tends to be an earlier symptom in LBO than SBO. Constipation may be 'absolute', meaning that the patient is unable to pass flatus, fluid and faeces; or not, which usually represents a less severe narrowing of the lumen to the extent flatus can still pass. Absolute constipation is a more worrying sign requiring more urgent investigation and intervention than if flatus can still be passed, as the latter will allow for partial decompression of the colon.

Severity of pain and symptoms depends on whether the patient has a competent or incompetent ileocaecal valve. A competent ileocaecal valve will allow passage of GI contents from the ileum into the colon but will not allow backflow of contents from the caecum into the terminal ileum. An incompetent valve will allow passage of chyme in both directions. In the presence of a competent valve, there is no mechanism for the obstructed large bowel to decompress into the small bowel, therefore there is greater distension of the colon. This is associated clinically with more severe pain and more rapidly progressive distension, similar to that seen in a 'closed loop' obstruction of the small bowel, which this is analogous to. There is a risk of distension to the point of serosal injury or perforation of the colon in this situation, with the caecum being particularly at risk as it is the site of the colon with the thinnest wall. LBO with a competent ileocaecal valve therefore requires more urgent intervention than that with an incompetent valve. Signs of impending caecal perforation are right iliac fossa pain, with tenderness over the caecum on palpation.

Assessment and investigation

This is very similar to that for a small bowel obstruction. A history and examination, including a digital rectal examination and examination of hernial orifices, may suggest the diagnosis and aetiology. Initial investigations are the same, including clinical assessment, bloods and fluid balance monitoring with resuscitation and urinary catheterization as appropriate.

The first-line imaging for suspected LBO is IV contrast-enhanced CT abdomen and pelvis (Figure 4). AXR is discouraged as it is unlikely to be able to determine aetiology, therefore can delay a definitive diagnosis.[12]

Depending on the CT findings and clinical condition, endoscopic assessment may help to obtain histological diagnosis, for

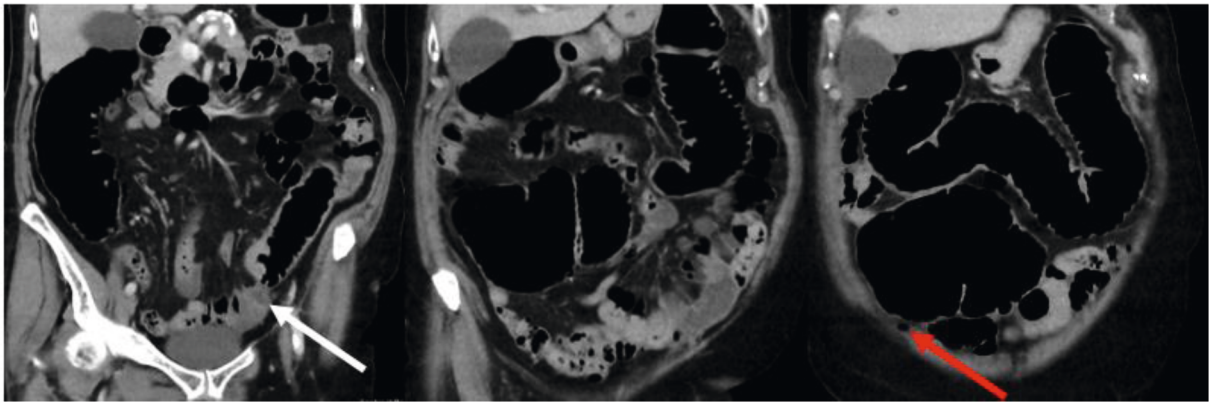

Figure 4 Coronal slices of CT showing obstructing sigmoid tumour (white arrow) with grossly dilated colon proximal to this and visible free gas (red arrow) indicating caecal perforation.

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example where there is doubt whether a stricture is malignant or benign in nature. However, this is not appropriate in cases where the patient is unstable, or where there is no doubt regarding a diagnosis of LBO and surgical intervention is indicated.

Management

The management of LBO will depend on the cause, however initial management is the same as for SBO. The early focus is on resuscitation and symptom control, expedient investigation to ascertain diagnosis and then definitive management. An NG is less likely to be effective at decompressing LBO as there is a greater length of GI tract to be decompressed. In the presence of a competent ileocaecal valve, even decompression of the entire upper GI tract will not resolve the distension of the obstructed colon. In these cases, the caecum is at risk of perforation. Tenderness in the right iliac fossa (RIF) or caecal diameter over 12 cm on imaging are features concerning for imminent perforation, and are indicators for emergent intervention. Resuscitation in cases of LBO may involve the administration of blood products, as in cases of malignancy these patients may be significantly anaemic.

Aetiology-specific management

Colorectal cancer: of all colorectal cancer diagnoses in the UK, 20% present as an emergency.[12] Emergency presentation is associated with poorer outcomes, including a 90-day mortality of 9.9%.[13] The cause of this high mortality is multifactorial, but includes the greater risks associated with emergency surgery and the fact patients who present as an emergency tend to have more advanced disease.[13]

The options for the management of obstructing colorectal cancer depend on both the tumour and the patient. However, they can be broadly divided into conservative, endoscopic and surgical strategies.

Conservative management is utilized where a curative approach is not possible, either because of the advanced stage of the tumour or because of the degree of co-morbidity of the patient. It is only appropriate in an imminently palliative scenario and focuses on keeping the patient comfortable by way of medication for pain and nausea and potentially an NG to alleviate vomiting. It should be noted that even in a palliative setting intervention may be appropriate in order to achieve symptomatic relief, as bowel obstruction is an unpleasant and undignified mode of mortality. For example, relief of obstruction via a defunctioning stoma or endoscopic stenting may provide immediate symptomatic improvement. It will also enable the patient to eat and drink and stop the nausea and pain associated with bowel obstruction, thereby allowing for a more planned, dignified and comfortable end.

Endoscopy may be used for therapeutic insertion of a self-expanding metal stent (SEMS) across the obstruction. These stents may be used either for palliation of symptoms or as a bridge to definitive surgery. In a palliative setting, aside from the alleviation of obstruction, the avoidance of surgery (even for a stoma) reduces hospital and intensive care unit length of stay, and decreases time to starting chemotherapy. In the potentially curative setting, stenting successfully alleviates obstruction in around 80% cases.[12] This allows time for resuscitation, formal staging of the tumour and definitive management planning. There were equivalent mortality and oncological outcomes between the delayed and immediate surgical groups, but a significantly lower stoma rate in the former.[14] However, stents cannot be used if there is perforation or peritonitis or if the lesion is low in the rectum. Any perforation at the time of stent insertion is associated with poorer disease-free survival.[12] SEMS are relatively contraindicated in those taking antiangiogenic chemotherapy (e.g. bevacizumab), as they are associated with potentially higher rates of perforation.[12]

Surgery may be curative or palliative, depending on whether the primary tumour is resectable or not. Palliative surgery allows for relief of the obstruction via formation of a defunctioning stoma (which can often be performed laparoscopically). This not only alleviates obstructive symptoms, but also can allow the patient to commence chemotherapy, with an aim to delay disease progression, or even in some cases to render the tumour resectable. Curative surgery involves removal of the tumour via a standard segmental colorectal resection. This may be undertaken via an open or laparoscopic approach, depending on the expertise of the surgeon and characteristics of the tumour and patient. If possible, resection with primary anastomosis is advocated,[12] although this will depend upon the condition of the proximal bowel, and the clinical condition of the patient. If there is significant damage to the proximal colon e.g. serosal tears or ischaemia secondary to the obstruction, or there are synchronous tumours, a subtotal colectomy may need to be performed.

Diverticular/benign strictures: the management options for these are similar to those for malignant strictures, being palliation, relief of obstruction via stenting or defunctioning stoma, or resection of the stricture. However, the success of SEMS in diverticular strictures is lower than that seen in malignant strictures.[12] The mainstay of treatment in these cases is therefore surgical resection, although this can be technically challenging due to the presence of post-inflammatory fibrosis and adhesions.

Volvulus is thought to account for 2–15% cases LBO in the Western world, with the most common sites being the sigmoid and caecum.[12] Risk factors for volvulus include increasing age and significant co-morbidities, especially neurological disorders, constipation and frailty. Sigmoid volvulus is more common in men, whereas caecal volvulus is more common in women.[15] In the case of a primary presentation, or where there is diagnostic uncertainty, CT abdomen and pelvis is the investigation of choice. CT will also allow for assessment of any potential complications of volvulus and assess viability of the bowel. AXR may, however, be appropriate in stable patients presenting with recurrent volvulus.[12]

Once the diagnosis has been confirmed on imaging, further management will depend on the site of volvulus. Sigmoid volvulus may be managed endoscopically if the patient is stable, but this should not be attempted in the presence of peritonism. The use of rigid and flexible sigmoidoscopy has been described, although flexible has slightly higher success rate for de-torsion and also enables better visualization of the health of the mucosa.[12] Following decompression, a flatus tube should be placed to prevent recurrence. Ideally, this should be left for 1–3 days. Should endoscopic decompression fail (in up to 22% cases[15]), urgent surgical intervention is required. This may require a

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Hartmann's procedure, where there is perforation or non-viable bowel, or a sigmoid resection with primary anastomosis if there are no adverse features in a stable patient. Even if endoscopic treatment is successful, consideration of elective surgical intervention is worthwhile as the recurrence rates are up to 85%.[12]

The likelihood of successful detorsion of caecal volvulus with endoscopic management is low, and associated with a risk of damage to the visualized bowel, and therefore is not recommended.[15] Surgery is therefore the primary treatment modality, with resection of the affected segment being the surgical option of choice, with or without anastomosis depending upon patient fitness and operative findings. There are limited data on the possibility of caecopexy or caecostomy, but outcomes were poor and data is decades old, therefore these procedures are not routinely recommended.[15]

Conclusion: large bowel obstruction

LBO is less common than SBO. Mural causes, such as cancer or diverticular disease, are more common than extrinsic causes. Initial investigation and resuscitation should occur synchronously and are similar to that for SBO. However, most cases will require operative intervention for the relief of symptoms and the prevention of complications.

Obstruction mimics

There are a several pathologies that can mimic the signs and symptoms of obstruction, but in the absence of a mechanical obstruction of the bowel. These include functional disorders of the GI tract, e.g. pseudo-obstruction or ileus, or pathologies with overlapping symptoms, e.g. gastroenteritis or severe constipation.

Pseudo-obstruction

Also known as Ogilvie's syndrome, pseudo-obstruction is characterized by marked distension of the bowel without a mechanical obstruction. Thought to result from dysregulated impulses in the colonic portion of the enteric nervous system,[15] it is commonly associated with systemic insult such as burns, systemic illness, or major surgery.[12] Pseudo-obstruction presents in a very similar manner to mechanical obstruction with abdominal distension, nausea and altered bowel function. It may be suspected on digital rectal exam if a capacious rectum is identified or based on a history of recent illness or surgical intervention in a comorbid patient. There may be a more insidious onset than that of mechanical obstruction, however there is still a risk of perforation or bowel ischaemia, and acute deterioration should prompt consideration of the presence of these complications.[15]

Pseudo-obstruction commonly coexists with acute renal dysfunction or electrolyte abnormalities, therefore these should be assessed for at presentation clinically and biochemically.[15] Abdominal radiograph features are similar to those of mechanical bowel obstruction, therefore CT is advocated as the diagnostic imaging modality of choice.[12] If the diagnosis is in doubt, rectal contrast can be given to prove there is no mechanical obstruction.

The initial management of these cases is supportive, including correction of any dehydration and electrolyte abnormalities, treatment of any concomitant infection, avoidance of aggravating medications (e.g. anticholinergics or opiates) and encouraging ambulation where possible. Some advocate the use of an NG and flatus tubes in the acute setting to encourage decompression of the bowel.[15] It is advised to avoid laxatives, as forced propulsion of gas or effluent into an already distended segment could precipitate perforation.[15] However, there are reports that prucalopride may be helpful in specific situations.[16] Conservative management can be continued for several days, as long as there are no concerning features on clinical examination or imaging, e.g. caecum >12 cm, increasing abdominal pain or leucocytosis.[15]

Should there be no resolution following these measures, the use of endoscopic decompression or neostigmine can be considered. Endoscopic colonic decompression, with or without insertion of a flatus tube, may need to be repeated but is associated with an 80% resolution rate.[15] Neostigmine is an anti-acetylcholinesterase which increases the levels of acetylcholine in the colon, thereby increasing colonic contractility and reducing transit time. It has been reported to resolve pseudo-obstruction in up to 90% cases.[15] It is usually given as a 2 mg bolus, although a 24 hour infusion has also been described. However, it should only be administered in an area with cardiac monitoring and with resuscitative drugs available as it can be associated with bradycardia and bronchospasm. Caution is advised in patients with cardiorespiratory comorbidity, and it is contraindicated in the presence of perforation or in pregnant patients.[15] Surgery is reserved for patients who are surgically fit but fail all above measures, are at risk of, or have already, perforated. The most common operation required in this scenario is a subtotal colectomy, but this will depend upon the viability of the bowel and the physiological state of the patient.

Ileus

Ileus is similar to pseudo-obstruction in that it is functional paralysis of the bowel, however it is more typically associated with the small bowel. It is most commonly seen following GI or other abdominal surgery and in this scenario tends to resolve with conservative management. The mainstay of management tends to be avoidance, with interventions such as laparoscopic surgery, avoidance of excessive opiate use postoperatively, early introduction of diet and early ambulation all proposed to decrease the incidence of ileus. Other measures, such as chewing gum or the introduction of probiotics, have had mixed results.[17] As for pseudo-obstruction, any concurrent infection or electrolyte disturbances should be actively sought and treated appropriately. Should ileus be prolonged, imaging should be considered to exclude mechanical obstruction or surgical complications, e.g. anastomostic leak or postoperative collections. Otherwise, it can be managed as for adhesional obstruction, i.e. NG decompression, fluid and electrolyte replacement and consideration of parenteral nutrition if prolonged, i.e. reduced enteral nutrition for over a week.

Conclusion

Intestinal obstruction is a common acute surgical presentation. It is most commonly classified into small and large bowel obstruction. Symptoms are similar for both, being vomiting,

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abdominal distension, pain and constipation, with the former being an earlier feature of SBO and the latter of LBO. CT is the imaging modality of choice and will suggest a cause for the obstruction as well as confirming the diagnosis and assessing for any complications such as perforation or ischaemia. The presence of complications mandates urgent surgical intervention, therefore concurrent investigation and resuscitation is required to enable prompt surgery when indicated. Otherwise, initial management involves fluid resuscitation, NG decompression and analgesia. Later management is determined by the aetiology and patient fitness, but may involve, conservative, medical, endoscopic or surgical treatment. It is a condition associated with relatively high morbidity and mortality, but these can be minimized with prompt treatment and prevention of complications. ◆

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Practice points

- Bowel obstruction has a high mortality rate, which can be reduced by prompt assessment and intervention
- The investigation of choice for diagnosis is CT imaging as this can provide information on the cause and site of obstruction, as well as the presence of complications
- Complications of bowel obstruction include perforation and ischaemia. Both of these are more likely in cases of a closed loop obstruction
- Adhesional small bowel obstruction is the most common subtype. In the absence of complications, a trial of conservative management is appropriate, colloquially known as 'drip and suck', involving IV fluid resuscitation and nasogastric tube decompression of the bowel
- Most cases of large bowel obstruction will require surgical intervention, depending on the fitness of the patient and the likely pathophysiology of the underlying cause
- Endoscopic intervention may be useful for: insertion of a colonic stent in certain cases of malignant obstruction, and for decompression of refractory pseudoobstruction.
- The mainstay of managing pseudo-obstruction is identifying and treating the underlying cause

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